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Title

Method of and equipment for credit management for access in a
telecommunications network.

Field of the Invention

5 The present invention relates to a method for managing unit
reservation of an account by a credit management system in a multi
service telecommunications system, wherein services are provided in
exchange for units and wherein a predetermined amount of units is
available for the account and which units are reserved before
10 provisioning of a service.

Background of the Invention

 International Patent Application nr. WO 98/56160 describes
a method wherein multiple parallel calls are provided in exchange for
units, and wherein for each call an amount of units is reserved. At the
15 end of each call, the remaining unused units are returned to the account.

 The take up of prepaid subscriptions for mobile telephony
has far exceeded anyone's expectations. Now in the light of 3G and true
multi-service mobile networks it is likely that prepaid will take an ever
greater stance. The introduction of prepaid into the fixed wireline
20 networks is also likely.

 Together with new technologies, the industry is
experiencing consumer prices dropping to a level just above cost. The
result of this is a significant increase in the level of service usage,
e.g. the number of calls made.

25 The introduction of family prepaid accounts, where the one
prepaid account has many users (mother, father, son, etc.), will
complicate matters even more.

 Moreover, the number of services offered is increasing
rapidly, the number of users is still growing and the frequency and
30 number of services accessed by each user is on the increase as well.
Since most of these services are charged, the requirements placed on
credit management systems (which responsibility is the financial

management of user accounts) are becoming more and more demanding. Multiple services need to be charged to one account, which can be accessed by multiple users at the same time.

5 In order to reduce the load on the credit management system, each service capability server, e.g. a service control point (SCP) for telephony calls or a wireless application protocol (WAP) gateway is likely to make use of credit control protocols which effectively reserve chunks of credit for the sole use of that service. For example, during a WAP session the WAP gateway may reserve 10 euros
10 from the credit management system.

Credit reservation can also be a requirement for service deployment when the cost of the service cannot be determined based on a linear expression of time. For example, in charging for web access, where some web pages cost more than others, it is unknown how many pages will
15 be accessed per minute and which pages will be accessed. Credit reservation ensures that services can be deployed with minimum delay.

Given the present situation, where multiple services can be accessed at the same time by one or more users, accordingly multiple credit reservations are placed against the same account at the same time.

20 It will be understood that a credit reservation differs from direct deduction of consumed credit from the account. Eventually, in the case of multiple credit reservations, a situation may occur where the credit management system shows a small amount of unreserved credits available and a service capability server requests to reserve or deduct a
25 number of credits exceeding that left over. In this case the service is denied while the user is informed of the fact that there are insufficient credits available for that service. In fact, however, there are sufficient credits available, but these are all reserved for usage by other services.

30 Known solutions are either to have one server handling prepaid access for all services or alternatively not to allow credit to

be reserved. However, the disadvantages of prior art is that neither option is suitable in a multi-service network.

The use of one service capability server handling all services is not feasible from an architectural point of view when discussing the large number of services available for mobile and fixed telephony and internet services.

The ability for service capability servers to reserve credit improves service delivery to the end-user and ensures availability of the credit management system to other users and servers. Removing the credit reservation facility will create serious architectural and performance issues.

Summary of the Invention

It is an object of the present invention to provide a system for and a method of handling credit reservations that reduce the amount of erroneous denials of service by service provisioning means to the user, whilst maintaining the benefits of the existing architectural design, i.e. performance due to credit reservation and multiple service capability servers.

Another object the present invention, related to this, is improvement of quality of service, contributing to customer satisfaction.

These and other objects and advantages of the present invention are provided by a method for credit management of an account in a multi service telecommunications system, wherein services are provided in exchange for units, wherein a predetermined amount of units is available for the account and which units are reserved before provisioning of a service, characterized in that a forced booking of actually consumed units can be carried out.

By carrying out forced booking of consumed credits the credit management system can send a message to all service capability

servers connected to an account, force them to book all the consumed credits and release the remaining credits. This ensures that the total balance in the account is up to date at the moment the forced booking has taken place. A forced booking could possibly take place as soon as the amount of credits in the account drops below a certain threshold.

If, following upon a forced booking, a forced credit accreditation request is being demanded by the credit management system, the service capability servers are informed of the availability of credits in the account and will place requests for credit at the credit management system. The credit management system will receive all outstanding requests and will start an accreditation procedure.

During the accreditation procedure the credit management system will be enabled to optimise distribution of available credits by using accreditation rules to evaluate the requests. For example, these accreditation rules can be based on history information like actual consumption of credits per unit of time, a classification of services (prioritization), the amount of credits requested, the life-span of the request (for how long it will be reserved) or any other desired parameter for optimisation.

By analysing these and other factors an appropriate amount can be accredited to the service capability server, the main principle being that upon accreditation each server is provided less credits than previously held before the forced booking. It is thus less likely that service will inappropriately be refused due to lack of funds, in case a small amount of credits is remaining in the account. As the credit balance approaches zero, various services (using a service classification) can be refused credit if multiple services are active at the same time.

The advantages of using this method are numerous. The number of incorrect denials of service will be reduced substantially, improving the quality of service to the user. Of course this will result

in improved customer satisfaction. Still, the performance benefits of credit reservation are maintained by allowing these reservations. In addition, the requirement of multiple service capability servers is met as well.

5 In an embodiment of the invention, a forced booking can be carried out by credit management, in order to force service provisioning means to book all consumed credits and release their reservations. This will enable credit management to update balance information of the account in order to rule out the possibility of providing incorrect
10 information to the customer and thus avoid denial of service where inapplicable.

 If this forced booking would be performed only in case the amount of credits drops below a predetermined threshold, the performance of a credit management means would not be disturbed too much.

15 In a further embodiment of the invention the forced booking could be made service dependent, for instance only the services with large outstanding credit reservations are forced to book their consumed credits. This approach could as well improve performance of the invention as it reduces the amount of bookings to be handled and does not require
20 attention from all service provisioning means.

 In yet another embodiment, the forced booking can be followed up by a request from the credit management means to the service provisioning means to place new accreditation requests for credit. This will avoid interference with the service provisioning processes as the
25 service provisioning means will be able to build up a credit reserve again.

 In addition, accreditation of these requests can be done according to accreditation rules that enable credit management to determine the most optimal distribution of credits amongst the service
30 provisioning means.

 These rules could be dependent on any parameter that

requires optimisation, which of is an inexhaustible list dependent on the requirements of the telecommunications system as a whole. A number of possibilities is provided here as an example:

- rate of credit consumption of a service,
- classification, for instance a prioritization, of services,
- requested amount of credits,
- life span of the request (is the amount requested for 1 minute or 10 minutes).

It will be appreciated that, in an embodiment of the invention, said credits are monetary units, units of time, units of volume, for instance data volume of data transmitted through a network or maybe dependent on the amount of used bandwidth by the user of the account.

The account could in another embodiment of the invention be accessed by multiple users, if desired, at the same time.

The services could be related to a group which comprises voice, data and internet communications. Specific examples of said services are voice telephony, email, WAP, facsimile services, multimedia services, etc.

The invention could in an alternative embodiment be used in a telecommunications network which can be accessed by users via both fixed and wireless connections.

Said telecommunication system, in an embodiment of the invention, could comprise a plurality of service provisioning systems, in communicative connection to said credit management.

Specifically, the invention could be part of a multi service telecommunications system, wherein services are provided in exchange for units, wherein a predetermined amount of units is available for the account and which units are reserved before provisioning of a service, wherein the credit of available units for the account is being

registered or managed by at least one credit management system.

Credit management of the invention could be a system or even a part of a system that is part of the telecommunications system as a whole. Of course alternatively, credit management can be performed at the user's premises, in the equipment used to access the network, or any other device in communicative connection with said telecommunications system.

Brief Description of the Drawings

FIGURE 1 shows a multi service telecommunications network including credit management according to the invention

FIGURE 2 shows a process flow diagram of the forced booking method according to the invention.

Detailed Description of the Embodiments

Figure 1 shows a multi service telecommunications network 1, which comprises a network 2 (comprising a set of exchanges, routers and other equipment physically connected with each other) a plurality of service provisioning gateways 3-7, providing services such as voice services 3, fax services 4, WAP services 5, e-mail services 6, and others 7 generally indicated by broken lines in fig. 1. It further comprises a credit management system 8, an exchange enabling access to the network, a base station 12 required to establish a wireless connection between mobile communications means 11 and exchange 9, fixed communications means 10 and a personal computer system 13. The credit management system 8, here connected to exchange 9, could be connected directly to or be part of the communications means 10-11 and 13, base station 12, any of the service gateways 3-7 or any other device in the network. In this figure the alternative connections for 8 are shown as dotted lines.

Suppose a single account can be accessed by any of the

means 10, 11 and 13 at any time and any of these means 10, 11 and 13 can make use of any of the services 3-7 at the same time. When mobile communications means 11 accesses the network through base station 12 and requests any of the services 3-7, for instance WAP 5, the service gateway 5 submits a credit reservation request at the credit management system 8 which determines whether the amount of credits is sufficient to accept the reservation. If, for instance, the reservation is accepted, the credit management system 8 notifies the WAP gateway 5 of the acceptance and the gateway provides service to the user at mobile communications means 11.

If, following upon WAP service provisioning to mobile communications means 11, personal computer system 13 requests e-mail services 6 while mobile user 11 is still using WAP (and maybe more services are requested by any of the users at 10, 11 and 13 at the same time), the credit management system 8 might discover there are insufficient credits still available for reservation. Credit management system 8 will force booking of all consumed credits and at the same time release all outstanding reservations, upon which the credit management system 13 updates the account balance information. The credit management system 8 will then request each of service gateways 3-7 to submit new credit accreditation requests (reservations) after which, upon receiving of the requests, the credit management system will evaluate all the requests using a set of accreditation rules.

The set of rules used to evaluate all requests and to accredit amounts of credit to service gateways 3-7, can be based on a inexhaustible number of desirable parameters to optimise. For example, the rules can be based on history information like credit consumption rate, a classification of services like a prioritization of services (voice could be more important to a user than WAP), the amount of credits requested, the life-span of the request (for how long is will the requested amount be reserved) or any other parameter.

With these rules, the credit management system 8 can decide upon the most optimal distribution of credits amongst the service gateways 3-7. The service gateways will then provide service to the user (or deny service in case the account is empty). The user will not experience denial of service unless his/her balance really is insufficient.

Figure 2 shows a typical process flow chart of the method according to the invention. As it is a communications protocol between service provisioning means 15 and credit management means 16, the flowchart shows where the events are happening on either sides of the dotted line.

The process starts with any service provisioning means 15 placing a credit request (reservation) 17 at credit management system 16. The credit management system 16, upon receiving the request, checks the balance of the account in step 18 and in case the balance check is positive the reservation is accepted 19 and service is provided 20. In case the balance check 18 shows a negative result, the credit management system carries out a forced booking 21a of all consumed credits, the service provisioning means 16 will book all consumed credits and release outstanding reservations in step 21b. The credit management system 16 then forces all service provisioning means 16 to submit their new credit accreditation requests in step 22, which requests are placed in step 23. After receiving these requests, the credit management system 16 will in step 24 evaluate all requests making use of a set of accreditation rules. These rules are dependent on and determined by the parameters that are desired to optimise distribution of credits 25 for. When all credit amounts are determined the credit management system 16 will distribute 25 the amounts amongst service provisioning means 15 which will on their turn provide service to the user in terminal step 26.

It will be appreciated that numerous modifications and variations of the present invention are possible in the light of the

above teachings. It is therefore understood that within the scope of the appended claims, the invention may be practised otherwise than as specifically described herein.